Office of Basic Energy Sciences
Office of Science

CD-4a, Approve Building Occupation for the Center for Functional Nanomaterials (CFN) A Nanoscale Science Research Center at Brookhaven National Laboratory

A. Purpose

The purpose of this paper is to document the review by the Office of Science Energy Systems Acquisition Advisory Board-equivalent for the Critical Decision "Approve Building Occupation (CD-4a)" for the Center for Functional Nanomaterials (CFN), a Nanoscale Science Research Center (NSRC) at Brookhaven National Laboratory (BNL).

B. Mission Need

The Center for Functional Nanomaterials (CFN) will serve as the nucleus of an integrated BNL program in nanoscience. It will facilitate major new directions in BNL's materials and chemical research programs, and greatly expand the capabilities available to a national user base, thereby increasing university and industrial interactions. The Center will enable the Nation to focus efforts in nanoscience and technology via promoting complementary, interdisciplinary work, including the Chemistry Department, the Materials Science Department, Condensed Matter Physics, the Instrumentation Division, the National Synchrotron Light Source Department, and the Biology Department. The Center will also integrate Nanoscale research with existing synchrotron capabilities in a broad range of techniques, including hard and soft x-ray scattering and spectroscopy, with new materials synthesis and nanofabrication capabilities including theory and modeling. The Center will serve as a focal point for collaborations, enabling studies of functional materials at the nanoscale involving academia and private industry. The CFN will be a highly collaborative unique National User facility for nanoscience.

The scientific goal of the CFN is to understand the chemical and physical response of nanomaterials, with the challenge being to attain the level of understanding needed to tailor or design new classes of functional materials. The CFN's programs will exploit the unique electronic and optical properties of nanoparticles and molecular nanoarrays to design chemical systems with specific functionality for diverse, energy-related applications such as catalysis, photo-induced energy conversion and storage, and molecular conductors. Another science emphasis will be to examine the behavior and fundamental properties of functional nanocomposite materials including ferro-electrics, and magnetic and superconducting thin films to provide insights into their future applications. This capability and focus are complementary to the other planned NSRCs; it capitalizes on the National Synchrotron Light Source (NSLS) leadership in new materials probes; and it builds on the strengths of BNL's BES programs in (1) strongly correlated electron systems, (2) catalysis, (3) molecular materials, (4) electrochemistry, and (5) nanostructure in complex functional materials.

C. Project Performance Scope Baseline

The CFN performance scope baseline consists of the CFN building, and procurement and installation of an initial set of specialized scientific equipment needed to support research activities in Nanoscience. The facility is a new building of 94,500 gross square feet (gsf) located across the street from the existing NSLS. The facility consist of a two-story building housing state-of-the-art clean rooms; wet and dry laboratories for sample preparation, fabrication, and analysis; office space for BNL staff and users; and conference rooms. The excess facility offset requirement has been satisfied from the "space bank" accumulated from previous demolition performed by BNL.

D. Project Performance Cost and Schedule Baseline

The performance baseline Total Estimated Cost (TEC) of $79.7 million and performance baseline Total Project Cost (TPC) of $81million are based on receiving the following funding levels (in thousands of dollars):

Fiscal Year	Total Estimated Cost		Other Project Costs	TPC
	Project Engineering & Design	Construction	Conceptual Design, NEPA, Hazard Analysis, Other, and Pre-Operations	Total
Prior			300	300
2003	988			988
2004	2,982			2,982
2005	1,996	18,317		20,313
2006		36,187		36,187
2007		18,864	500	19,364
2008		366	500	866
	5,966	73,734		
Total	79,700		1,300	81,000

The performance schedule baseline is as follows:		Baseline Date	Actual/Forecast Date
CD-0	Approve Mission Need	June 2002	June 2002 (A)
CD-1	Approve Alternative Selection and Cost Range	July 2003	July 2003 (A)
CD-2	Approve Performance Baseline	May 2004	May 2004 (A)
CD-3	Approve Start of Construction	Dec 2004	Aug 2005 (A)
CD-4a	Approve Start of Building Occupation	April 2007	April 2007
CD-4b	Approve Start of Full Operations	April 2008	April 2008

E. Project Status Review

A Department of Energy (DOE) Office of Science (SC) review of the Center for Functional Nanomaterials (CFN) project, located at the Brookhaven National Laboratory (BNL), was conducted on March 13-14, 2007. The review was conducted at the request of Dr. Patricia M. Dehmer, Associate Director for Basic Energy Sciences and chaired by Mr. Stephen Tkaczyk, Office of Project Assessment. The purpose of the review was to evaluate the project's progress in all areas: technical, cost, schedule, management, and environment, safety and health (ES&H). In addition, the committee evaluated progress with respect to the expectations of readiness for building occupancy and Critical Decision 4a (CD-4a, Approve Building Occupation) scheduled for April 2007.

Overall, the Committee judged that the project is on track to meet its technical, cost, and schedule baseline objectives. The consensus among the Committee was that the CFN Building is substantially complete and all the requirements for CD-4a will be met in the next several weeks.

There were no action items resulting from the review.

F. Current Status

The CFN building is substantially complete. The clean room is complete and certified. The radiant wall panels to control temperature in the high accuracy laboratories are installed. BCP No. 12 captured all remaining miscellaneous building changes, there is no anticipated additional funding needed from the remaining contingency of $3.7M for the building.

The ES&H performance through the duration of construction has been very good. The contractor, E.W. Howell, will be awarded the safety incentive as specified in their contract.

G. Critical Decision (CD) – 4a

In the Project Execution Plan, CD-4a is defined as "Approve Building Occupation". A detail description to satisfy building occupation is in Appendix B and C of the Transition to Operations Plan. The Federal Project Director along with the BHSO staff verified that these criteria have been met and they are summarized below.

Beneficial Occupancy Criteria (Appendix B)

1. The building structures are complete including all walls, floors, ceilings, roofs, windows, structural members, and means of egress such as doors and stairs.
2. Life safety systems (exit lights, emergency lights, building alarms), including the fire sprinkler and detection systems in common areas and ducts (with the exception of the laser detector in the atrium), have been accepted and placed in service.
3. All building egress systems (exit doors and stairs) have been accepted, are in service and not obstructed or compromised by on-going construction activity.
4. All facility electrical power, communication and lighting systems necessary for life safety are completed, accepted and placed in service.
5. All conventional building services and utilities are accepted and placed in service including water, sewer, HVAC, compressed air, chilled water, steam & condensate.

6. Surface treatments such as paint, carpet, floor tile, ceiling tile etc. have been substantially completed in the common and support areas of the building and those labs identified for initial occupancy.
7. Air flows throughout the building are adequate to assure that the building HVAC system is functioning properly, and necessary exhaust flows and pressures for operational safety are achieved.
8. BNL O&M/Fire Department staff has received necessary training for the building life safety systems determined to be necessary for beneficial occupancy in accordance with the BVH Commissioning Plan.
9. All testing, inspection and certification documents for life safety systems have been turned over to the CFN Project.

CD-4a Criteria (Appendix C)

1. All prime contractor construction is substantially complete.
2. All Beneficial Occupancy Readiness Evaluation (BORE) pre-start items are complete.
3. All BORE post-start and contractor punch list items schedule and assigned.
4. Final operations and maintenance documentation for building systems has been turned over to the project and to BNL's Operations and Maintenance (O&M) Division.
5. All testing, inspection and certification documents have been turned over to the CFN Project.
6. All as-built drawings and Engineering Change Notices (ECNs) are available to the project for configuration management.

CD-4a Documentation

1. Critical Decision 4a (CD-4a) sign off document
2. Preliminary Hazard Analysis
3. Fire Hazard Analysis
4. Baseline Chemical Inventory
5. Training and Qualifications Requirements/Records
6. Interim operating procedures
7. Building emergency plans
8. Project closeout documentation
9. Transition to Operations Plan
10. BORE Appointment Memo
11. BORE Report

Submitted by:

Joseph Eng
DOE Federal Project Director
DOE Brookhaven Site Office

April 16, 2007
Date

Michael D. Holland, Manager
DOE Brookhaven Site Office

4/16/07
Date

Thomas M. Brown, Program Manager
Office of Basic Energy Sciences
Office of Science

4/17/07
Date

Recommendations

The undersigned "Do Recommend" (Yes) or "Do Not Recommend" (No) approval of CD-4a, Approve Building Occupation, for the Center for Functional Nanomaterials at BNL as noted below.

ESAAB Secretariat, Office of Project Assessment	4/24/07 Date	Yes X	No
Representative, Non-Proponent SC Program Office	4/24/07 Date	Yes X	No
Representative, Financial Mgmt. Division	4/24/07 Date	Yes ✓	No
Representative, Environmental, Safety and Health Division	4-24-07 Date	Yes ✓	No
Representative, Security Mgmt. Team	4/24/07 Date	Yes ✓	No
Representative, Laboratory Infrastructure Division	4/24/07 Date	Yes ✓	No
Representative, Grants and Contracts Division	Date	Yes	No

Approval

Based on the material presented above and at this review, Critical Decision-4a, Approve Building Occupation, is approved. Transition to Operations activities, including technical equipment installation and final hook-up and testing can commence.

Patricia M. Dehmer
Director, Basic Energy Sciences

4/24/2007
Date